1. **Answer:**

   a) This will be a disaster. In a recession, surpluses go down (we run deficits) and the real value of the debt goes up. Inflation eases, which adds to the real value of the debt. Thus the facts show a strong negative correlation between $s_t$ and $(b_{t+1} - b_t)$. We do not see high values of debt when the level of surpluses are high in a boom, and low values of the debt when the level of surpluses are low in a recession.

   b) The main suggestion, which we worked through in a problem set, is to note that $s_t$ should not be an AR(1). The government is not trying to cause inflation. When we run deficits today, we also promise higher surpluses in the future. We also talked about discount rate changes. Interest rates are lower in recessions, which raises the value of the debt and helps to give the observed pattern. But that’s secondary.

2. Both would respond that $MV = PY$ holds in their models as well. To a fiscalist, the issue is, does $M$ cause $P$ and $P$ cause $s$, or does $s$, $B$ cause $P$, and then $P$ causes $M$ by passive money. *You can’t tell* from a sample. To a Taylor rule person, the issue is do central banks control $M$ and then $i$ follows or do they do what they loudly state they do – is $i$ controlled and then $M$ follows.

   **Facts:** Both might point to the fact that all the central banks in the sample are visibly targeting interest rates, not money. Thus, money is endogenous. VARs do not show much inflation variance caused by money shocks. Instead, they also suggest causality runs from $p$ to $m$. Taylorites might point to the correlation between inflation variability and $\phi_\pi$ estimates. A fiscalist might point to collapses despite currency boards or other institutions that look like they control $M$ very well.

3)

   a) You could sell more long term debt. This lowers inflation today, but increases it tomorrow.

   b) **Equations.**

   $$
   \frac{B_t(t+1)}{P_{t+1}} = s_{t+1}
   $$

   $$
   \frac{B_{t-1}(t)}{P_t} = s_t + Q_t \frac{B_t(t+1) - B_{t-1}(t+1)}{P_t}
   $$

   $$
   \frac{B_{t-1}(t)}{P_t} = s_t + \beta \frac{B_t(t+1) - B_{t-1}(t+1)}{P_{t+1}}
   $$

   $$
   \frac{B_{t-1}(t)}{P_t} = s_t + \beta \frac{B_t(t+1) - B_{t-1}(t+1)}{P_{t+1}} s_{t+1}
   $$

   $$
   \frac{B_{t-1}(t)}{P_t} = s_t + \beta \left[ 1 - \frac{B_{t-1}(t+1)}{B_t(t+1)} \right] s_{t+1}
   $$
c) You can still control $B_t(t + 1)$, total debt outstanding today and due next year. As $B_t(t + 1)$ increases, $P_{t+1}$ increases. (top equation), But, so long as $B_{t-1}(t + 1) \neq 0$, raising $B_t(t + 1)$ lowers $P_t$.

4) The equilibrium condition is, in both cases

$$\phi \pi_t + x_t = E_t \pi_{t+1}$$

a) New Keynesians take $\phi > 1$ then solve forward

$$\pi_t = -\frac{1}{\phi} x_t + \frac{1}{\phi} E_t \pi_{t+1}$$

Thus, a rise in $x$ gives an immediate decline by $\phi - \rho$, and then reversion by an AR(1) pattern.

b) The fiscal equation means that

$$\frac{B_{t-1}}{P_t} = E_t \sum \beta^j s_{t+j}.$$ Since nothing here changes with a monetary policy shock, that means $P_t$ and $\pi_t$ cannot respond to the shock. The immediate response must be $\pi_t = 0$.

$$\phi \pi_t + x_t = \pi_{t+1}$$

$$0 + 1 = \pi_{t+1}$$

After that, we have

$$\phi \pi_{t+1} + x_{t+1} = \pi_{t+2}$$

$$\phi + \rho = \pi_{t+2}$$

$$2\phi = \pi_{t+2}$$

$$\phi (\phi + \rho) + \rho^2 = \pi_{t+3}$$

$$\phi^2 + \rho \phi + \rho^2 = \pi_{t+3}$$

$$3\phi^2 = \pi_{t+3}$$

$$\phi \pi_{t+3} + x_{t+3} = \pi_{t+4}$$

$$\phi^3 + \rho \phi^2 + \rho^2 \phi + \rho^3 = \pi_{t+4}$$

$$4\phi^3 = \pi_{t+4}$$

The plot of $t\phi^{t-1}$ first grows linearly, then declines geometrically.